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U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue, ECL-111
Seattle, Washington 98101

Attention: Ms. Holly Arrigoni

DNAPL INVESTIGATION SUMMARY
CORRECTIVE MEASURES IMPLEMENTATION
UNIVAR USA INC., PORTLAND, OREGON
ORD 009227398

Dear Ms. Arrigoni:

PES Environmental, Inc. (PES), on behalf of Univar USA Inc. (Univar), has prepared this letter to summarize and evaluate the data that has been collected and activities that have been performed at the Univar facility located at 3950 NW Yeon Avenue, Portland, Oregon, during the multi-phase dense non-aqueous phase liquid (DNAPL) investigation. DNAPL investigation activities were conducted between April 2008 and May 2011 under approved work plans for the Corrective Measures Implementation (CMI) source area design investigation.

The majority of the data and activities described in this letter have been previously summarized in other reports including the Design Investigation Summary Report (PES, 2009b – Appendix B), the Supplemental DNAPL Investigation Work Plan (PES, 2010a), the Technology Identification and Screening Technical Memorandum (PES, 2011b), and in routine quarterly progress reports. This summary letter consolidates the DNAPL investigation-related information from these reports and includes excerpts of previously submitted data tables and copies of previously submitted soil boring logs and monitoring well construction diagrams (attached).

FILE COPY

The DNAPL investigation data and information presented in this letter will be incorporated into the site's conceptual site model (CSM). The CSM will be updated in a future Supplemental Corrective Measures Study (CMS) report as described in the approved CMI Work Plan Addendum (PES, 2010b).

BACKGROUND

The multi-phase CMI design investigation included investigation of shallow groundwater, soil lithology, and the nature and extent of volatile organic compounds (VOCs) in the source areas of documented historical releases. The purpose of the investigation was to obtain design information to support the selected final remedy described in the Statement of Basis (EPA, 2006) and the Amendment to the Administrative Order on Consent to Implement Corrective Action

1087-10-18-3008 (AOC Amendment; EPA 2007) between the U.S. Environmental Protection Agency, Region 10 (EPA) and Univar.

Additional objectives of the design investigation were to determine the nature and extent of light non-aqueous phase liquid (LNAPL) that was discovered near SVE well SG-6 in 2007 and dense non-aqueous phase liquid (DNAPL) that was discovered in the area near the Corrosives Tank Farm in 2008. Figure 1 presents a map of the CMI design investigation area showing the locations all of the current monitoring wells, piezometers, extraction wells, soil vapor extraction (SVE) wells, as well as the location of all of the investigation borings associated with the design investigation activities.

The CMI design investigation at the Univar facility has been described in the following approved work plans:

- Final Design Investigation Work Plan (PES, 2008a);
- Supplemental Design Investigation Work Plan (PES, 2008b); and
- Final DNAPL Investigation Work Plan (PES, 2009a).

Work specifically related to the DNAPL investigation included the following activities:

- Drilling 46 direct push soil borings (GP-26 through GP-72) into the silt aquitard at the base of the upper aquifer to evaluate the potential extent of DNAPL in shallow soil and groundwater. Soil borings were drilled between April 2008 and June 2009;
- Installing and developing two shallow groundwater monitoring wells (SMW-37 and SMW-38) for the purposes of DNAPL monitoring and DNAPL recovery near the Corrosives Tank Farm and the Tank Farm Office (also referred to as Scale House). The wells were installed and initially developed in June 2009, and the well screens were designed to penetrate the silt/sand interface at the base of the upper aquifer to facilitate DNAPL accumulation and recovery;
- Gauging of monitoring wells SMW-37 and SMW-38 for water level and DNAPL thickness, and removing accumulated DNAPL when the observed thickness reached 0.25 feet or greater. The monitoring and recovery work was conducted one to three times per month and in conjunction with other routine monitoring. The DNAPL recovery work proved to be more challenging than originally planned, so additional approved work plans were prepared and implemented to address health and safety concerns, to refine DNAPL recovery techniques, and to include additional rounds of well development (PES, 2010a and 2011a).
- Analyzing samples of DNAPL for volatile organic compounds (VOCs) and for specific gravity, flashpoint and pH (based on volume of available DNAPL); and

- Surveying all of the design investigation locations to the City of Portland datum and to the existing site-specific horizontal grid. The survey data were used to develop a contour map for the silt/sand interface at the base of the upper aquifer (Figure 2).

DNAPL NATURE AND DISTRIBUTION

The nature and extent of DNAPL was investigated during all phases of the CMI design investigation. Observations of DNAPL and/or evidence that was indicative of potential DNAPL occurred in both the design investigation soil borings and the design investigation monitoring wells. The following includes discussion of DNAPL related components of the CMI design investigation including direct push soil borings, soil and groundwater samples collected from soil borings, monitoring wells, DNAPL monitoring and recovery, and DNAPL and groundwater sampling from monitoring wells.

Soil Borings

Evidence of DNAPL initially occurred in soil and groundwater samples collected from beneath the water table in ten direct push soil borings (GP-26, GP-29, GP-35, GP-57, GP-58A, GP-60, GP-65, GP-70, GP-71, and GP-72), all located adjacent to or near the existing Corrosives Tank Farm in the northeast portion of the source area. Soil borings GP-70, GP-71, and GP-72 were angle borings (approximately 30 degrees) such that soil and groundwater samples were collected from beneath Corrosives Tank Farm; and the remaining soil borings were drilled vertically. Soil boring locations are shown on Figures 1 through 3, and copies of the soil boring logs are attached to this letter.

- **Soil Samples**. The evidence of DNAPL in soil samples included sheen and/or droplets (GP-29 and GP-35), visible yellowish-colored product (GP-60), and elevated field photo-ionization detector (PID) measurements and/or strong chemical odor (GP-26, GP-57, GP-58a, GP-65, and GP-71). Soil samples from GP-29, GP-35, and GP-57 had elevated VOC concentrations that were indicative of potential DNAPL (i.e., total VOC concentrations between 3,200 milligrams per kilogram [mg/kg] to 64,000 mg/kg). The primary VOCs in these samples included tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (TCA), toluene, xylenes, and methylene chloride (MeCl); most of which were either primary VOCs and/or were detected in the DNAPL samples from GP-29 and monitoring well SMW-38. DNAPL sample results are discussed later in more detail.

  Some of the soil sample results were inconsistent with groundwater sample results from the same soil boring and sampling interval. Three notable examples include the MeCl concentrations in GP-26 (0.30U mg/kg in soil vs. 150,000 micrograms per liter [μg/L] in groundwater), GP-70 (610 mg/kg vs. 3,100,000 μg/L), and GP-72 (3.3U mg/kg vs. 5,400,000 μg/L). Groundwater sample results are discussed later in more detail. Laboratory VOC results for soil samples collected from near the silt/sand contact are included in Table 1.

- **Groundwater Samples**. The groundwater sample collected from near the bottom of soil boring GP-29 contained visible DNAPL, and groundwater samples collected from soil borings GP-26, GP-35, GP-58A, GP-60, GP-65, GP-70, and GP-72 had elevated VOC concentrations that were indicative of potential DNAPL. Soil borings GP-35, GP-58A, GP-60, and GP-65 are located south of the Corrosives Tank Farm, and soil borings GP-26, GP-29, GP-70, and GP-72 are located near the northern edge of the Corrosives Tank Farm. Laboratory VOC results for groundwater samples collected from near the silt/sand contact are included in Table 2, and DNAPL sample results are included in Table 3.

  The primary VOCs in soil borings located south of the Corrosives Tank Farm (GP-35, GP-58A, GP-60, and GP-65) were toluene, TCA, cis-1,2-DCE (cDCE), TCE, PCE, and MeCl. The primary VOCs are listed in descending order based on average concentrations between the samples. These primary groundwater sample VOCs were either primary VOCs and/or detected in DNAPL and soil samples. The total VOC concentrations in groundwater samples from these soil borings ranged from 190,000 micrograms per liter (μg/L) to 680,000 μg/L.

  The primary VOCs in soil borings located near the northern edge of the Corrosives Tank Farm (GP-26, GP-70, and GP-72) were MeCl, cDCE, TCE, toluene, and PCE (listed in descending order based on average concentrations between the samples). Similar to the discussion above, these VOCs, these primary groundwater sample VOCs were either primary VOCs and/or detected in DNAPL and soil samples. The total VOC concentrations in groundwater samples from these soil borings ranged from 280,000 μg/L to 5,500,000 μg/L. The greatest concentrations of any individual VOC were MeCl in GP-70 (3,100,000 μg/L) and in GP-72 (5,400,000 μg/L). These MeCl concentrations were one or more orders of magnitude greater than any of the primary/individual VOC concentrations detected in all of the other groundwater samples. The relatively high concentrations of MeCl in groundwater may be related to the water solubility of MeCl, which is one or more orders of magnitude greater than that of the primary VOCs detected in other groundwater samples. Also described earlier, these samples were collected from beneath the Corrosives Tank Farm in angled soil borings.

Figure 2 shows the locations of the soil borings and monitoring wells relative to elevations of the silt/sand contact at the base of the upper aquifer. The base of the aquifer is deepest along the rail spur that runs on the west side of the dock and is shallower to the east, south, and southwest of the rail spur. There is evidence of depressions (or low spots) beneath the Corrosives Tank Farm, near monitoring well SMW-38, near SVE well SG-4, and near soil boring GP-40. Figure 3 shows locations of observed DNAPL in both soil borings and monitoring wells. By overlaying both of these figures, it is apparent that DNAPL (observed and indicated) appears to be limited to the vicinity of the Corrosives Tank Farm in depressions in the silt/sand contact surface at the base of the upper aquifer. Other depressions in the silt/sand contact surface were either not indicative of DNAPL (e.g., near soil boring GP-40 and SVE well SG-4a), or were not accessible due to the overlying footprint of the Corrosives Tank Farm.

It should be noted that historical solvent operations, which predated the Corrosives Tank Farm, are thought to be the likely contributor of DNAPL contaminant source material discovered in the design investigation. Prior to the Corrosives Tank Farm, this area included solvent drum filling operations and two sets of former underground storage tanks (UTSs) storing solvents. Bulk solvent operations are currently located to the south of the DNAPL source area and include the Solvents Tank Farm and the Drum Fill Shed (Figure 1).

DNAPL Monitoring

Two shallow monitoring wells (SMW-37 and SMW-38) were installed for the purposes of DNAPL monitoring and DNAPL recovery. The wells were installed in areas where DNAPL was observed in soil borings, and where there were depressions in the silt/sand contact surface at the base of the upper aquifer. The wells were installed with screens that penetrate the silt/sand interface at the base of the upper aquifer to facilitate DNAPL accumulation and recovery. Measureable DNAPL has been observed in both monitoring wells; as of the latest monitoring event in May 2011, there is no observable DNAPL in either of the monitoring wells.

The DNAPL monitoring results for SMW-37 and SMW-38 are described below, historical DNAPL monitoring and recovery data is included in Table 4. The locations of monitoring wells SMW-37 and SMW-38 are shown on Figures 1 through 3, and the well construction diagrams are attached to this letter.

- SMW-37. DNAPL was first encountered in monitoring well SMW-37 in April and May 2010 following testing in which 250 gallons of groundwater was pumped from the well over a period of a few hours. DNAPL thickness declined from 0.30 to 0.08 feet over the next three consecutive bi-weekly monitoring events. DNAPL has not been observed since May 2010, even though the well was redeveloped in August 2010 per a supplemental design investigation work plan (PES, 2010a). Consistent with this work plan, this well was dropped from the DNAPL monitoring program and was incorporated into the routine groundwater monitoring program in November 2010.

- SMW-38. DNAPL was encountered during the initial well development in June 2009, and approximately 2.0 feet of DNAPL was measured in the next monitoring event on August 6, 2009. The DNAPL elevation on August 6 (6.17 ft) was approximately 0.27 ft above the sand/silt contact at the base of the upper aquifer, which potentially indicated a thickness of DNAPL that may have extended beyond the well borehole. The DNAPL was removed from the well, and a thickness of approximately 1.0 foot was routinely monitored over the next nine months. DNAPL removal work was temporarily stopped to refine DNAPL recovery techniques and address health and safety concerns, and was resumed in May 2010 after approval of a supplemental work plan (PES, 2010a). DNAPL removal on May 25, 2010 (2.06 gallons) resulted in declining DNAPL thickness over the next few months (0.05 feet to 0.2 feet). The well was redeveloped in August 2010, which resulted in a one-time DNAPL thickness of 0.02 feet in November 2010. Measurable DNAPL has not been observed since November 2010 even though the well was redeveloped again in March 2011 per a supplemental scope of work (PES, 2011a). It should be noted that a small stringer of DNAPL was observed in the pump discharge tubing during the March 2011 well development, but measurable DNAPL could not be detected in the purge water collection drum (i.e., less than 0.01-foot thickness). Consistent with the supplemental design investigation work plan (PES, 2010a), this well was dropped from the DNAPL monitoring program and was incorporated into the routine groundwater monitoring program in May 2011.

DNAPL Recovery

Approximately 3.8 gallons of DNAPL has been recovered since June 2009, and the entire volume has been from monitoring well SMW-38. As described above, recoverable thickness of DNAPL was observed in SMW-37 in April 2010, however due to approval of the Supplemental DNAPL Investigation Work Plan (PES, 2010a) one week prior to the monitoring event, PES was not yet equipped to recover DNAPL. The subsequent DNAPL thicknesses on May 5 and 25, 2010 were lower than the criteria for DNAPL recovery (e.g., 0.25 feet DNAPL thickness or greater), and measurable DNAPL has not been observed in this well since May 2010. DNAPL monitoring and recovery information is included in Tables 4 and 5.

DNAPL Samples

Samples of DNAPL have been collected from soil boring GP-29 and from monitoring well SMW-38 and analyzed for VOCs by EPA Method 8260. The DNAPL sample results are described below and summarized in Table 4.

- **GP-29**. The groundwater sample collected from soil boring GP-29 in April 2008 contained visible DNAPL. Laboratory analysis of the DNAPL indicates the primary VOC constituents of the DNAPL in this area are PCE (61 percent), TCE (23 percent), TCA (12 percent), toluene (2 percent), xylenes (1 percent), and methylene chloride (1 percent).

- **SMW-38**. A sample of DNAPL was collected from SMW-38 during the initial well development in June 2009. Laboratory analysis of the DNAPL indicates the primary VOC constituents of the DNAPL in this area are 1,1,1-TCA (90 percent), PCE (4 percent), toluene (4 percent), TCE (1 percent), and less than 1 percent of other chlorinated and non-chlorinated VOCs. The DNAPL was also analyzed for specific gravity (1.3) by Standard Method 2710F, flashpoint (85 degrees Centigrade) by EPA Method 1020A, and pH (2.03) by EPA Method 9040B.

Neither of the DNAPL sample results correlate with bulk products currently stored in the Corrosives Tank Farm, however, chlorinated solvents were historically stored in this area.

Groundwater Samples from Monitoring Wells

A limited number of monitoring well samples related to the DNAPL investigation have been collected from SMW-37 and SMW-38. As described above, these wells are screened across the silt/sand contact at the base of the upper aquifer. Groundwater samples from monitoring wells SMW-37 and SMW-38 are summarized in Table 6.

- SMW-37. A total of five groundwater samples have been collected from monitoring well SMW-37. Four of the five samples were collected using a peristaltic pump and low flow purging techniques (June 2009, April 2010, November 2010, and May 2011). The low flow pump intake tubing was set near the middle of the well screen at a depth of 29.5 feet (or approximately 2.4 feet above the silt/sand contact at the base of the upper aquifer). These samples were collected under varying conditions, with the June 2009 and April 2010 samples being collected during well development, and with November 2010 and May 2011 collected during routine semi-annual groundwater monitoring events. The remaining sample (August 2010) was collected from the purge water tote after 130 gallons of purge water had been removed from the well.

  The VOC results have been somewhat variable between the samples, and although there is not an apparent trend, the variability may be related to the varying sampling conditions. Total VOC concentrations have ranges between 50,000 μg/L (November 2010) and 580,000 μg/L (May 2011), both occurring during routine semi-annual groundwater monitoring events. The primary VOCs were TCE, PCE, TCA, MeCl, cDCE, and toluene (listed in descending order based on concentration); which is similar to the VOCs that were detected in groundwater samples collected from GP-26, GP-70, and GP-72. However, the groundwater MeCl concentrations in SMW-37 were one or more orders of magnitude lower than those in GP-70 and GP-72.

- SMW-38. A groundwater sample was collected from SMW-38 for the first time in May 2011 using a peristaltic pump and low flow purging techniques. The pump intake tubing was set near the middle of the well screen at a depth of 29.5 feet (or approximately 2.7 feet above the silt/sand contact at the base of the upper aquifer). The total VOC concentrations for the May 2011 sample was 850,000 μg/L, and the primary VOCs (1,1,1-TCA, toluene, PCE, and TCE) mirrored those from the DNAPL sample that was collected from SMW-38 in June 2009. As discussed earlier, these primary groundwater sample VOCs are the same primary VOCs that were detected in soil groundwater samples collected from GP-35, GP-58A, GP-60, and GP-65.

CONCLUSIONS

There does not appear to be a significant or continuous free-phase DNAPL plume, although there is evidence of DNAPL near the north edge of the Corrosives Tank Farm and near monitoring well SMW-38. Both of these locations are in areas where underground storage tanks and aboveground solvent handling activities were previously located. The underground storage tanks were removed in 1985, and the tanks were tested and found to be tight (Appendix H; HLA, 1993).

The high VOC concentrations in groundwater samples from monitoring wells SMW-37 and SMW-38 (post DNAPL presence in both wells), and the high VOC concentrations in the 2008 and 2009 soil boring samples indicate that there may be additional DNAPL near the Corrosives Tank Farm that has not yet been observed directly. Furthermore, high VOC concentrations (soil and groundwater) in soil borings near the perimeter of the Corrosives Tank Farm indicate a high likelihood of source material beneath the tank farm. However, additional delineation in this area would be extremely difficult due to the footprint of the tank farm and the facility operations.

The information collected during the CMI design investigation suggests that DNAPL is likely present as a residual (i.e., disconnected blobs and ganglia which occupy a fraction of the soil matrix pore space) rather than distributed in connected or continuous "pools" of DNAPL (i.e., where DNAPL occupies the majority of pore space). A very limited volume of free phase DNAPL has been discovered, and that volume has largely been removed.

RECOMMENDATIONS

We recommend that monitoring wells SMW-37 and SMW-38 continue to be gauged and sampled concurrent with the routine groundwater monitoring schedule (quarterly gauging and semi-annual groundwater sampling; PES, 2011c). Monitoring and sampling results will be reported in quarterly progress reports. If DNAPL thickness of 0.25 feet or greater is observed in any monitoring well, the well will be gauged again within one month and EPA will be contacted if a DNAPL thickness of 0.25 feet or greater is confirmed. Recommendations for additional DNAPL monitoring and possibly DNAPL recovery will be evaluated at that time.

If you have any questions or would like to discuss this letter, please call the undersigned at (206) 529-3980 or George Sylvester at (303) 838-7260.

Sincerely,

PES ENVIRONMENTAL, INC.

Brian O'Neal

Matthew V. Dahl

Brian O'Neal, P.E.
Associate Engineer

Matthew V. Dahl, P.E.
Senior Engineer

Attachments: References
Tables
Illustrations
Soil Boring Logs

cc: Mr. George Sylvester, Univar USA Inc.
Mr. Rob Matteson, Univar USA Inc.
Mr. Rene' Fuentes, U.S. Environmental Protection Agency
Mr. Bruce Long, U.S. Environmental Protection Agency
Mr. Bruce Gilles, Oregon Department of Environmental Quality

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TABLES

TABLES

Table 1

VOCs in Soil Samples from Soil Borings
Univar USA Inc. - Portland, Oregon

Boring ID	GP-26	GP-29	GP-35	GP-57	GP-58A	GP-60	GP-65	GP-70	GP-71	GP-72
Sample Depth (ft)	31.5	32	30	27	30	31.5	28	39	37	38.75
Compound	4/7/08	4/4/08	4/4/08	9/8/08	9/10/08	9/12/08	9/8/08	6/25/09	6/26/09	6/26/09
Dichlorodifluoromethane (CFC 12)	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Chloromethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Vinyl Chloride	0.074 U	50 U	1.8 U	0.65 U	2.4 U	**0.37**	0.20 U	0.71 U	0.070 U	**1.0**
Bromomethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Chloroethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Trichlorofluoromethane (CFC 11)	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
1,1-Dichloroethene (1,1-DCE)	0.074 U	**68**	**7.2**	**2.2**	2.4 U	**0.94**	0.20 U	0.71 U	**0.17**	**0.14**
Acetone	3.0 U	2,000 U	70 U	26 U	95 U	7.3 U	7.8 U	29 U	2.8 U	3.3 U
Carbon Dislfide	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Methylene Chloride	0.30 U	**530**	**12**	2.6 U	9.5 U	**9.7**	0.78 U	**610**	**0.90**	3.3 U
trans-1,2-Dichloroethene	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
1,1-Dichloroethane (1,1-DCA)	0.074 U	50 U	**5.4**	**4.9**	2.4 U	**1.6**	**0.40**	0.71 U	**0.19**	**0.24**
2,2-Dichloropropane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
cis-1,2-Dichloroethene	**0.19**	50 U	**5.8**	**21**	**5.6**	**2.6**	**3.2**	**3.5**	**11**	**9.7**
2-Butanone (MEK)	3.0 U	2,000 U	70 U	26 U	95 U	7.3 U	7.8 U	29 U	2.8 U	3.3 U
Bromochloromethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Chloroform	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
1,1,1-Trichloroethane (TCA)	**0.75**	**7,300**	**720**	**310**	**23**	**24**	**5.7**	0.71 U	**0.25**	0.082 U
Carbon Tetrachloride	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
1,1-Dichloropropene	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Benzene	0.074 U	50 U	1.8 U	**0.83**	2.4 U	**0.30**	0.20 U	0.71 U	0.070 U	0.082 U
1,2-Dichloroethane (EDC)	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Trichloroethene (TCE)	**1.5**	**15,000**	**420**	**260**	**67**	**17**	**25**	**9.4**	**1.6**	0.082 U
1,2-Dichloropropane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Dibromomethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Bromodichloromethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
cis-1,3-Dichloropropene	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
4-Methyl-2-pentanone (MIBK)	3.0 U	2,000 U	70 U	26 U	95 U	7.3 U	7.8 U	29 U	2.80 U	3.3 U
Toluene	**0.84**	**950**	**1,100**	**990**	**190**	**35**	**76**	**9.3**	**15**	**0.65**
trans-1,3-Dichloropropene	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
1,1,2-Trichloroethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Tetrachloroethene (PCE)	**22**	**40,000**	**1,100**	**370**	**290**	**22**	**51**	**8.9**	**0.65**	0.082 U
2-Hexanone	3.0 U	2,000 U	70 U	26 U	95 U	7.3 U	7.8 U	29 U	2.8 U	3.3 U
1,3-Dichloropropane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Dibromochloromethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
1,2-Dibromoethane (EDB)	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
Chlorobenzene	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Ethylbenzene	**0.57**	**120**	**190**	**370**	**73**	**4.8**	**15**	0.71 U	**3.4**	**1.4**
1,1,1,2-Tetrachloroethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
m,p-Xylenes	**0.44**	**380**	**630**	**690**	**240**	**15**	**46**	**0.72**	**2.0**	**0.21**
o-Xylene	**0.15**	**150**	**220**	**150**	**67**	**4.6**	**15**	0.71 U	**0.62**	0.082 U
Styrene	**1.6**	50 U	**35**	**18**	**5.3**	**0.36**	**0.53**	0.71 U	0.070 U	0.082 U
Bromoform	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Isopropylbenzene	0.30 U	200 U	7.0 U	**3.2**	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
1,1,2,2-Tetrachloroethane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
Bromobenzene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
n-Propylbenzene	0.30 U	200 U	**9.7**	**6.7**	9.5 U	0.73 U	**0.81**	2.9 U	0.28 U	0.33 U
1,2,3-Trichloropropane	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
2-Chlorotoluene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
1,3,5-Trimethylbenzene	0.30 U	200 U	**15**	**11**	9.5 U	0.73 U	**1.6**	2.9 U	0.28 U	0.33 U
4-Chlorotoulene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
tert-Butylbenzene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
1,2,4-Trimethylbenzene	0.30 U	200 U	**36**	**31**	**11**	**0.94**	**4.5**	2.9 U	0.28 U	0.33 U
sec-Butylbenzene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.20 U	2.9 U	0.28 U	0.33 U
4-Isopropyltoluene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	**1.2**	2.9 U	**1.7**	0.33 U
1,3-Dichlorobenzene	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	0.20 U	0.71 U	0.070 U	0.082 U
1,4-Dichlorobenzene	0.074 U	50 U	1.8 U	0.65 U	2.4 U	0.19 U	**0.25**	0.71 U	**0.15**	0.082 U
n-Butylbenzene	0.30 U	200 U	7.0 U	**3.0**	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
1,2-Dichlorobenzene	**0.11**	50 U	1.8 U	0.65 U	2.4 U	**0.20**	**0.65**	0.71 U	**0.95**	0.082 U
1,2-Dibromo-3-chloropropane (DBCP)	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
1,2,4-Trichlorobenzene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
Hexachlorobutadiene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
Naphthalene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	**1.1**	2.9 U	0.28 U	0.33 U
1,2,3-Trichlorobenzene	0.30 U	200 U	7.0 U	2.6 U	9.5 U	0.73 U	0.78 U	2.9 U	0.28 U	0.33 U
TOTAL VOCs	**28**	**64,000**	**4,500**	**3,200**	**1,000**	**140**	**200**	**640**	**39**	**13**

NOTES:

1. The data in this table has been excerpted from Design Investigation Summary Report (PES, 2009b – Appendix B), and includes soil samples collected soil borings where there was field evidence of DNAPL. Only those soil samples collected from near the silt/sand contact at the base of the upper aquifer are shown.
2. VOCs = volatile organic compounds.
3. Analyzed using EPA Method 8260.
4. Results reported in mg/kg.
5. Detected results highlighted in bold.
6. U = the compound was not detected at or above the concentration shown.
7. J = concentration is an estimated quantity based on data review.
8. Soil borings GP-70 and GP-72 were drilled with an auger angled up to 30 degrees from vertical; the sample depths are relative to the boring and not vertical depth below grade.
9. Total VOC concentrations include the sum of detected VOCs, and the sum is rounded to the nearest significant digit that is consistent with the laboratory report.

Table 2

VOCs in Groundwater Samples from Soil Borings
Univar USA Inc. - Portland, Oregon

Boring ID Sample Depth (ft) Compound	GP-26 31-32 4/7/08	GP-35 30.5-31.5 4/7/08	GP-57 25-27 9/8/08	GP-58A 29-30 9/10/08	GP-60 31.5-32.5 9/12/08	GP-65 26-28 9/8/08	GP-70 38-40 6/25/09	GP-71 38-40 6/26/09	GP-72 38-40 6/26/09
Dichlorodifluoromethane (CFC 12)	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Chloromethane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Vinyl Chloride	500 U	**1,200**	**270**	**580**	**1,600**	**170**	**680**	**260**	2,500 U
Bromomethane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Chloroethane	500 U	500 U	**83**	250 U	500 U	50 U	500 U	25 U	2,500 U
Trichlorofluoromethane (CFC 11)	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
1,1-Dichloroethene (1,1-DCE)	**1,500**	**6,100**	**160**	**1,900**	**4,400**	**2,000**	**1,000**	**220**	2,500 U
Acetone	20,000 U	20,000 U	1,000 U	10,000 U	20,000 U	2,000 U	20,000 U	1,000 U	100,000 U
Carbon Dislfide	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Methylene Chloride	**150,000**	**54,000**	100 U	1,000 U	**74,000**	**910**	**3,100,000**	**170**	**5,400,000**
trans-1,2-Dichloroethene	500 U	500 U	25 U	250 U	500 U	50 U	500 U	**120**	2,500 U
1,1-Dichloroethane (1,1-DCA)	**1,900**	**8,700**	**910**	**1,300**	**9,800**	**1,400**	**1,400**	**840**	**3,800**
2,2-Dichloropropane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
cis-1,2-Dichloroethene	**46,000**	**5,300**	**8,500**	**49,000**	**6,500**	**20,000**	**11,000**	**24,000**	**13,000**
2-Butanone (MEK)	20,000 U	20,000 U	1,000 U	10,000 U	20,000 U	2,000 U	20,000 U	1,000 U	100,000 U
Bromochloromethane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Chloroform	500 U	**520**	25 U	250 U	500 U	**170**	500 U	25 U	2,500 U
1,1,1-Trichloroethane (TCA)	**600**	**200,000**	**93**	**34,000**	**240,000**	**14,000**	**1,200**	25 U	2,500 U
Carbon Tetrachloride	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
1,1-Dichloropropene	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Benzene	500 U	**610**	**460**	250 U	**690**	**87**	500 U	**53**	2,500 U
1,2-Dichloroethane (EDC)	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Trichloroethene (TCE)	**27,000**	**95,000**	**140**	**23,000**	**90,000**	**36,000**	**21,000**	**71**	**32,000**
1,2-Dichloropropane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Dibromomethane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Bromodichloromethane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
cis-1,3-Dichloropropene	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
4-Methyl-2-pentanone (MIBK)	20,000 U	20,000 U	1,000 U	10,000 U	20,000 U	2,000 U	20,000 U	1,000 U	100,000 U
Toluene	**30,000**	**160,000**	**6,200**	**100,000**	**180,000**	**82,000**	**16,000**	**750**	**9,900**
trans-1,3-Dichloropropene	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
1,1,2-Trichloroethane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Tetrachloroethene (PCE)	**19,000**	**38,000**	**180**	**33,000**	**36,000**	**14,000**	**4,400**	25 U	**3,600**
2-Hexanone	20,000 U	20,000 U	1,000 U	10,000 U	20,000 U	2,000 U	20,000 U	1,000 U	100,000 U
1,3-Dichloropropane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Dibromochloromethane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
1,2-Dibromoethane (EDB)	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
Chlorobenzene	500 U	500 U	**30**	250 U	500 U	50 U	500 U	25 U	2,500 U
Ethylbenzene	500 U	**7,100**	**190**	**5,500**	**6,600**	**3,000**	500 U	**390**	2,500 U
1,1,1,2-Tetrachloroethane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
m,p-Xylenes	**1,100**	**22,000**	**420**	**16,000**	**20,000**	**8,000**	500 U	**360**	2,500 U
o-Xylene	500 U	**7,600**	**120**	**5,600**	**6,900**	**2,800**	500 U	**46**	2,500 U
Styrene	500 U	**1,700**	25 U	**780**	**1,300**	**220**	500 U	25 U	2,500 U
Bromoform	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Isopropylbenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
1,1,2,2-Tetrachloroethane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
Bromobenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
n-Propylbenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
1,2,3-Trichloropropane	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
2-Chlorotoluene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
1,3,5-Trimethylbenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
4-Chlorotoulene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
tert-Butylbenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
1,2,4-Trimethylbenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	**330**	2,000 U	100 U	10,000 U
sec-Butylbenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
4-Isopropyltoluene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
1,3-Dichlorobenzene	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
1,4-Dichlorobenzene	500 U	500 U	25 U	250 U	500 U	50 U	500 U	25 U	2,500 U
n-Butylbenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
1,2-Dichlorobenzene	500 U	500 U	25 U	250 U	500 U	**50**	500 U	25 U	2,500 U
1,2-Dibromo-3-chloropropane (DBCP)	2,000 U	2,000 U	100 U	1,000 U	2,000 U	50 U	2,000 U	100 U	10,000 U
1,2,4-Trichlorobenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
Hexachlorobutadiene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
Naphthalene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
1,2,3-Trichlorobenzene	2,000 U	2,000 U	100 U	1,000 U	2,000 U	200 U	2,000 U	100 U	10,000 U
TOTAL VOCs	**280,000**	**610,000**	**18,000**	**270,000**	**680,000**	**190,000**	**3,200,000**	**27,000**	**5,500,000**

NOTES:

1. The data in this table has been excerpted from Design Investigation Summary Report (PES, 2009b – Appendix B), and includes groundwater samples collected soil borings where there was field evidence of DNAPL. Only those groundwater samples collected from near the silt/sand contact at the base of the upper aquifer are listed. The results for the DNAPL sample collected from soil boring GP-29 are included in Table 3.
2. VOCs = volatile organic compounds.
3. Analyzed using EPA Method 8260.
4. Results reported in µg/L.
5. Detected results highlighted in bold.
6. U = the compound was not detected at or above the concentration shown.
7. Total VOC concentrations include the sum of detected VOCs, and the sum is rounded to the nearest significant digit that is consistent with the laboratory report.

Table 3

VOCs in DNAPL Samples
Univar USA Inc. - Portland, Oregon

Boring or Well ID / Sample Depth (ft) / Compound	GP-29 32-33 4/4/08		SMW-38 33-34 6/29/09	
Dichlorodifluoromethane (CFC 12)	1,300	U	500	U
Chloromethane	1,300	U	500	U
Vinyl Chloride	1,300	U	500	U
Bromomethane	1,300	U	500	U
Chloroethane	1,300	U	500	U
Trichlorofluoromethane (CFC 11)	1,300	U	500	U
1,1-Dichloroethene (1,1-DCE)	**1,800**		**1,900**	
Acetone	50,000	U	20,000	U
Carbon Dislfide	1,300	U	500	U
Methylene Chloride	**10,000**		**2,200**	
trans-1,2-Dichloroethene	1,300	U	500	U
1,1-Dichloroethane (1,1-DCA)	1,300	U	**2,200**	
2,2-Dichloropropane	1,300	U	500	U
cis-1,2-Dichloroethene	1,300	U	**810**	
2-Butanone (MEK)	50,000	U	20,000	U
Bromochloromethane	1,300	U	500	U
Chloroform	1,300	U	500	U
1,1,1-Trichloroethane (TCA)	**200,000**		**920,000**	
Carbon Tetrachloride	1,300	U	500	U
1,1-Dichloropropene	1,300	U	500	U
Benzene	1,300	U	500	U
1,2-Dichloroethane (EDC)	1,300	U	500	U
Trichloroethene (TCE)	**380,000**		**11,000**	
1,2-Dichloropropane	1,300	U	500	U
Dibromomethane	1,300	U	500	U
Bromodichloromethane	1,300	U	500	U
cis-1,3-Dichloropropene	1,300	U	500	U
4-Methyl-2-pentanone (MIBK)	50,000	U	20,000	U
Toluene	**25,000**		**39,000**	
trans-1,3-Dichloropropene	1,300	U	500	U
1,1,2-Trichloroethane	1,300	U	500	U
Tetrachloroethene (PCE)	**1,000,000**		**38,000**	
2-Hexanone	50,000	U	20,000	U
1,3-Dichloropropane	1,300	U	500	U
Dibromochloromethane	1,300	U	500	U
1,2-Dibromoethane (EDB)	5,000	U	2,000	U
Chlorobenzene	1,300	U	500	U
Ethylbenzene	**2,800**		**1,400**	
1,1,1,2-Tetrachloroethane	1,300	U	500	U
m,p-Xylenes	**9,100**		**4,400**	
o-Xylene	**3,500**		**1,300**	
Styrene	1,300	U	500	U
Bromoform	1,300	U	500	U
Isopropylbenzene	5,000	U	2,000	U
1,1,2,2-Tetrachloroethane	1,300	U	500	U
Bromobenzene	5,000	U	2,000	U
n-Propylbenzene	5,000	U	2,000	U
1,2,3-Trichloropropane	1,300	U	500	U
2-Chlorotoluene	5,000	U	2,000	U
1,3,5-Trimethylbenzene	5,000	U	2,000	U
4-Chlorotoulene	5,000	U	2,000	U
tert-Butylbenzene	5,000	U	2,000	U
1,2,4-Trimethylbenzene	5,000	U	2,000	U
sec-Butylbenzene	5,000	U	2,000	U
4-Isopropyltoluene	5,000	U	2,000	U
1,3-Dichlorobenzene	1,300	U	500	U
1,4-Dichlorobenzene	1,300	U	500	U
n-Butylbenzene	5,000	U	2,000	U
1,2-Dichlorobenzene	1,300	U	500	U
1,2-Dibromo-3-chloropropane (DBCP)	5,000	U	2,000	U
1,2,4-Trichlorobenzene	5,000	U	2,000	U
Hexachlorobutadiene	5,000	U	2,000	U
Naphthalene	5,000	U	2,000	U
1,2,3-Trichlorobenzene	5,000	U	2,000	U

NOTES:

1. The data in this table has been excerpted from Design Investigation Summary Report (PES, 2009b – Appendix B) - Tables 3 and 4.
2. VOCs = volatile organic compounds.
3. Analyzed using EPA Method 8260.
4. Results reported in mg/kg.
5. Detected results highlighted in bold.
6. U = the compound was not detected at or above the concentration shown.
7. GP-29 sample was collected from the soil boring using direct push sampling equipment.
8. SMW-38 sample was collected from a bailer during intial well development.

Table 4

DNAPL Monitoring Data
Univar USA Inc., Portland, Oregon

Monitoring Well	Measuring Point Elevation	Date	Depth to Water (ft)	Water Elevation (ft)	Depth to DNAPL (ft)	Depth to Well Bottom (ft)	Apparent DNAPL Thickness (ft)	DNAPL Elevation (ft)	DNAPL Recovery Volume (gallon)	Comments
SMW-37	38.11	6/24/2009	—	—	—	—	—	—	—	Well installation.
		6/24/2009	11.86	26.25	—	33.50	—	—	—	Well development and sampling.
		8/6/2009	12.16	25.95	—	33.51	—	—	—	
		8/26/2009	12.38	25.73	—	33.50	—	—	—	
		9/21/2009	12.58	25.53	—	33.50	—	—	—	
		10/20/2009	12.88	25.23	—	33.50	—	—	—	
		11/3/2009	12.92	25.19	—	33.55	—	—	—	
		11/16/2009	12.79	25.32	—	33.53	—	—	—	
		12/3/2009	12.61	25.50	—	33.55	—	—	—	
		12/17/2009	12.52	25.59	—	33.50	—	—	—	
		12/29/2009	12.40	25.71	—	33.50	—	—	—	
		1/13/2010	12.18	25.93	—	NM	—	—	—	
		2/3/2010	11.73	26.38	—	33.53	—	—	—	
		2/18/2010	11.51	26.60	—	33.57	—	—	—	
		2/23/2010	11.48	26.63	—	33.50	—	—	—	
		3/15/2010	11.30	26.81	—	33.50	—	—	—	
		4/1/2010	11.18	26.93	—	33.50	—	—	—	Well development.
		4/12/2010	10.99	27.12	—	33.50	—	—	—	
		4/27/2010	10.89	27.22	33.20	33.50	0.30	4.91	—	See Note 10.
		5/10/2010	10.92	27.19	33.28	33.50	0.22	4.83	—	
		5/25/2010	10.93	27.18	33.42	33.50	0.08	4.69	—	
		6/7/2010	10.76	27.35	—	33.50	—	—	—	
		6/22/2010	10.59	27.52	—	33.50	—	—	—	
		7/6/2010	10.62	27.49	—	33.50	—	—	—	
		7/15/2010	10.73	27.38	—	33.50	—	—	—	
		7/30/2010	10.89	27.22	—	33.50	—	—	—	
		8/10/2010	11.01	27.10	—	33.50	—	—	—	
		8/17/2010	11.05	27.06	—	33.48	—	—	—	Well development.
		8/21/2010	11.15	26.96	—	33.50	—	—	—	Well development.
		10/12/2010	11.55	26.56	—	33.42	—	—	—	
		11/2/2010	11.57	26.54	—	33.52	—	—	—	

Table 4

DNAPL Monitoring Data
Univar USA Inc., Portland, Oregon

Monitoring Well	Measuring Point Elevation	Date	Depth to Water (ft)	Water Elevation (ft)	Depth to DNAPL (ft)	Depth to Well Bottom (ft)	Apparent DNAPL Thickness (ft)	DNAPL Elevation (ft)	DNAPL Recovery Volume (gallon)	Comments
SMW-37 (continued)	38.11	11/15/2010	11.42	26.69	—	32.55	—	—	—	See Note 11.
		2/24/2011	10.11	28.00	—	33.60	—	—	—	See Note 11.
		5/16/2011	9.41	28.70	—	33.50	—	—	—	See Note 11.
SMW-38	38.12	6/24/2009	—	—	—	—	—	—	—	Well installation.
		6/29/2009	11.84	26.28	32.85	33.85	1.00	5.27	0.50	See Note 12.
		8/6/2009	12.20	25.92	31.95	33.95	2.00	6.17	0.83	See Note 13.
		8/26/2009	12.37	25.75	32.82	33.84	1.02	5.30	—	
		9/21/2009	12.61	25.51	32.79	NM	—	—	—	
		10/20/2009	12.89	25.23	32.76	33.76	1.00	5.36	—	
		11/3/2009	12.94	25.18	32.76	33.77	1.01	5.36	—	
		11/16/2009	12.83	25.29	32.75	33.80	1.05	5.37	—	
		12/3/2009	12.65	25.47	32.76	33.79	1.03	5.36	—	
		12/17/2009	12.61	25.51	32.72	33.70	0.98	5.40	—	
		12/29/2009	12.45	25.67	32.75	33.80	1.05	5.37	—	
		1/13/2010	12.21	25.91	32.70	33.80	1.10	5.42	—	
		2/3/2010	11.76	26.36	32.72	33.80	1.08	5.40	—	
		2/18/2010	11.56	26.56	32.70	33.80	1.10	5.42	—	
		2/23/2010	11.51	26.61	32.76	33.80	1.04	5.36	—	
		3/15/2010	11.34	26.78	32.70	33.80	1.10	5.42	—	
		4/1/2010	11.22	26.90	32.80	33.80	1.00	5.32	—	
		4/12/2010	11.04	27.08	32.70	33.80	1.10	5.42	—	
		4/27/2010	10.91	27.21	32.70	33.80	1.10	5.42	—	
		5/10/2010	10.93	27.19	32.72	33.80	1.08	5.40	—	
		5/25/2010	10.96	27.16	32.71	33.80	1.09	5.41	2.06	
		6/7/2010	10.82	27.30	33.60	33.80	0.20	4.52	—	
		6/22/2010	10.62	27.50	33.80	33.80	*	4.32	—	
		7/6/2010	10.65	27.47	33.75	33.80	0.05	4.37	—	
		7/15/2010	10.79	27.33	33.70	33.80	0.10	4.42	—	
		7/30/2010	10.93	27.19	33.65	33.70	0.05	4.47	—	
		8/10/2010	11.03	27.09	33.75	33.80	0.05	4.37	—	
		8/21/2010	11.03	27.09	—	33.75	—	—	0.41	Well development. See Note 14.

Table 4

DNAPL Monitoring Data
Univar USA Inc., Portland, Oregon

Monitoring Well	Measuring Point Elevation	Date	Depth to Water (ft)	Water Elevation (ft)	Depth to DNAPL (ft)	Depth to Well Bottom (ft)	Apparent DNAPL Thickness (ft)	DNAPL Elevation (ft)	DNAPL Recovery Volume (gallon)	Comments
SMW-38 (continued)	38.12	10/12/2010	11.57	26.55	—	33.80	—	—	—	
		11/2/2010	11.64	26.48	33.72	33.74	0.02	4.40	—	
		11/15/2010	11.43	26.69	—	NM	—	—	—	
		12/8/2010	11.12	27.00	—	33.80	—	—	—	
		12/29/2010	10.60	27.52	—	32.80	*	—	—	
		1/11/2011	10.40	27.72	—	33.80	—	—	—	
		2/2/2011	10.13	27.99	—	33.80	—	—	—	
		2/24/2011	10.13	27.99	—	33.80	—	—	—	
		3/11/2011	9.79	28.33	—	33.80	*	—	—	
		3/26/2011	9.48	28.64	—	33.80	—	—	—	Well development. See Note 15.
		4/8/2011	9.35	28.77	—	33.84	—	—	—	
		4/28/2011	9.22	28.90	—	33.85	—	—	—	
		5/16/2011	9.39	28.73	—	33.80	—	—	—	See Note 11.

NOTES:

1. The data in this table from June 2009 through March 2011 was previously included in quarterly progress reports. The data for April and May 2011 will be included in the pending progress report for the second quarter of 2011 reporting period.
2. Measuring point = top of well casing or top of well cap.
3. Elevations are in feet relative to the city of Portland datum.
4. DNAPL = dense non-aqueous phase liquid.
5. NM = not measured.
6. -- = not applicable.
7. * = DNAPL indicated by electronic interface probe; DNAPL thickness not measured.
8. The approximate elevation of the base of the upper aquifer is 6.2 ft at SMW-37 and 5.9 ft at SMW-38.
9. Per Final DNAPL Investigation Work Plan (PES, 2009a) DNAPL is to be recovered from wells with 0.25 ft of thickness or greater.
10. Due to recent approval of the Supplemental DNAPL Investigation Work Plan (PES, 2010a) on April 21, 2010, PES was not yet equipped to recover DNAPL. Subsequent DNAPL thickness' on May 5 and 25, 2010 were lower than the criteria for DNAPL recovery (e.g., 0.25 ft DNAPL thickness or greater).
11. Monitoring well has been incorporated into routine groundwater monitoring program including quarterly water levels and semi-annual collection of groundwater samples (May and November).
12. Approximately 1 ft of DNAPL was observed in bailer during intial well development. Sample of DNAPL was submitted for laboratory analysis.
13. The DNAPL elevation is approximately 0.27 feet above silt/sand contact at the base of the upper aquifer indicating that DNAPL may extend outside of the well borehole.
14. DNAPL was recovered during well development, however DNAPL was not observed in well immediately before or immediately after the well development work.
15. A stringer of DNAPL was noticed in the pump discharge tubing during well development. However, DNAPL was not detected in development water recovery drum.

Table 5

DNAPL Recovery Data
Univar USA Inc., Portland, Oregon

Date	DNAPL Removal				Wells with DNAPL Recovery
	Event		Cumulative		
	Volume (gal)	Mass (lbs)	Volume (gal)	Mass (lbs)	
06/29/09	0.50	5.4	0.50	5.4	SMW-38
08/06/09	0.83	9.0	1.33	14.4	SMW-38
05/25/10	2.06	22.4	3.39	36.8	SMW-38
08/21/10	0.41	4.5	3.80	41.2	SMW-38

NOTES:

1. The data in this table was previously included in quarterly progress reports.
2. DNAPL = dense non-aqueous phase liquid.
3. DNAPL mass estimate is based on specific gravity of 1.3 measured in LNAPL collected from SMW-38.

Table 6

VOCs in Groundwater Samples from Monitoring Wells
Univar USA Inc. - Portland, Oregon

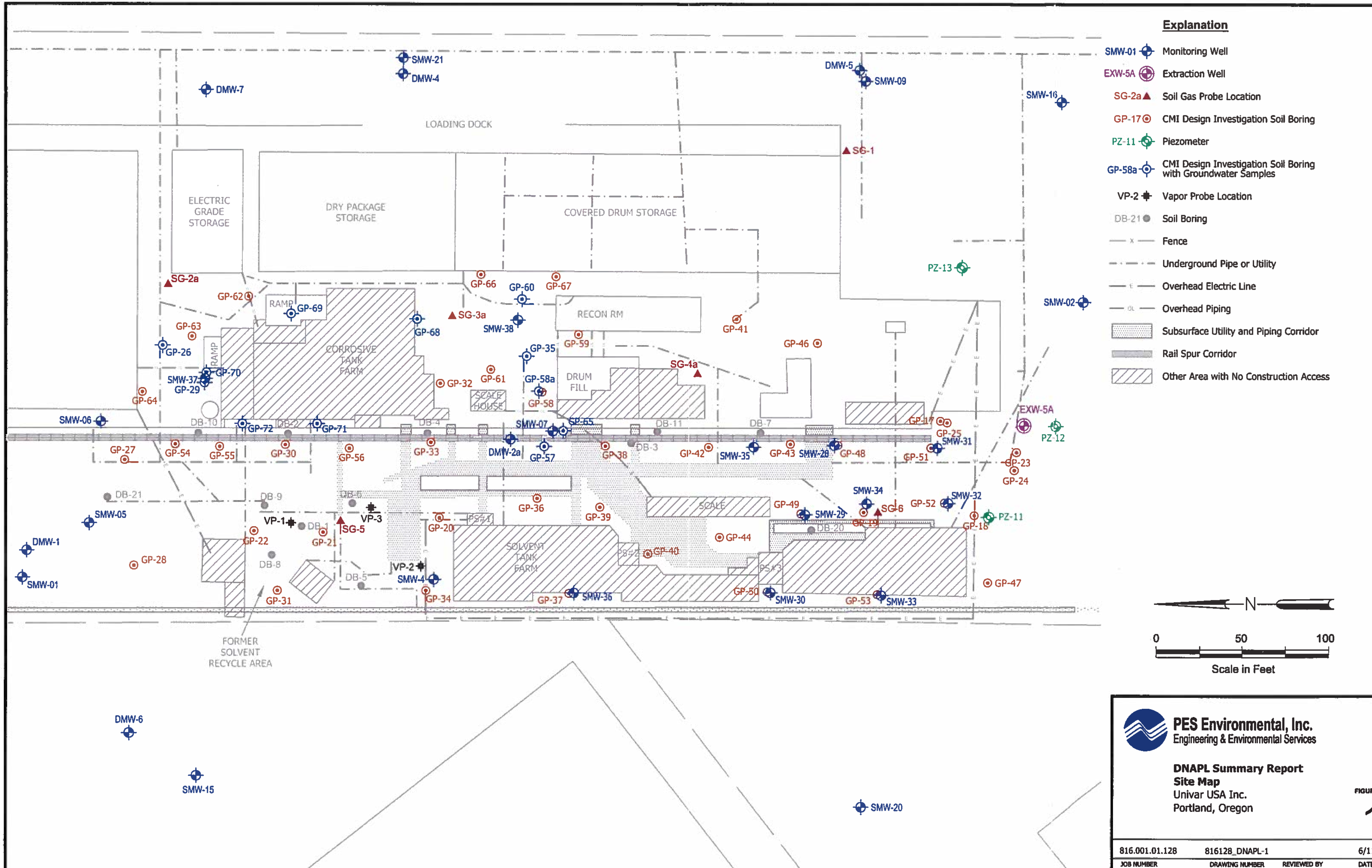
Well ID / Sample Depth (ft) / Compound	SMW-37 29.5 6/30/09	SMW-37 (See Note 7) 04/01/10	SMW-37 (See Note 8) 08/21/10	SMW-37 29.5 11/19/10	SMW-37 29.5 05/17/11	SMW-38 29.5 05/17/11
Dichlorodifluoromethane (CFC 12)	100 U	130 U	250 U	25 U	130 U	250 U
Chloromethane	100 U	130 U	250 U	25 U	130 U	250 U
Vinyl Chloride	100 U	130 U	250 U	25 U	130 U	**2,100**
Bromomethane	100 U	130 U	250 U	25 U	130 U	250 U
Chloroethane	100 U	130 U	250 U	25 U	130 U	250 U
Trichlorofluoromethane (CFC 11)	100 U	130 U	250 U	25 U	130 U	250 U
1,1-Dichloroethene (1,1-DCE)	**610**	**1,100**	**2,700**	**170**	**4,600**	**3,800**
Acetone	4,000 U	5,000 U	10,000 U	1,000 U	5,000 U	10,000 U
Carbon Dislfide	100 U	**140**	**540**	25 U	**510**	250 U
Methylene Chloride	**16,000**	**32,000**	**34,000**	**250**	**120,000**	**2,400**
trans-1,2-Dichloroethene	100 U	130 U	250 U	**42**	130 U	250 U
1,1-Dichloroethane (1,1-DCA)	**760**	**710**	**1,600**	**300**	**3,100**	**6,000**
2,2-Dichloropropane	100 U	130 U	250 U	25 U	130 U	250 U
cis-1,2-Dichloroethene	**4,400**	**8,600**	**17,000**	**10,000**	**15,000**	**10,000**
2-Butanone (MEK)	4,000 U	5,000 U	10,000 U	1,000 U	5,000 U	10,000 U
Bromochloromethane	100 U	130 U	250 U	25 U	130 U	250 U
Chloroform	100 U	**130**	**420**	25 U	**540**	250 U
1,1,1-Trichloroethane (TCA)	**9,800**	**30,000**	**130,000**	**9,100**	**100,000**	**750,000**
Carbon Tetrachloride	100 U	130 U	**330**	25 U	**150**	250 U
1,1-Dichloropropene	100 U	130 U	250 U	25 U	130 U	250 U
Benzene	100 U	130 U	250 U	25 U	130 U	**690**
1,2-Dichloroethane (EDC)	100 U	130 U	250 U	25 U	130 U	250 U
Trichloroethene (TCE)	**34,000**	**92,000**	**250,000**	**16,000**	**220,000**	**15,000**
1,2-Dichloropropane	100 U	130 U	250 U	25 U	130 U	250 U
Dibromomethane	100 U	130 U	250 U	25 U	130 U	250 U
Bromodichloromethane	100 U	130 U	250 U	25 U	130 U	250 U
cis-1,3-Dichloropropene	100 U	130 U	250 U	25 U	130 U	250 U
4-Methyl-2-pentanone (MIBK)	4,000 U	5,000 U	10,000 U	1,000 U	5,000 U	10,000 U
Toluene	**8,300**	**26,000**	**14,000**	**870**	**14,000**	**35,000**
trans-1,3-Dichloropropene	100 U	130 U	250 U	25 U	130 U	250 U
1,1,2-Trichloroethane	100 U	130 U	250 U	25 U	130 U	250 U
Tetrachloroethene (PCE)	**45,000**	**87,000**	**120,000**	**13,000**	**100,000**	**20,000**
2-Hexanone	4,000 U	5,000 U	10,000 U	1,000 U	5,000 U	10,000 U
1,3-Dichloropropane	100 U	130 U	250 U	25 U	130 U	250 U
Dibromochloromethane	100 U	130 U	250 U	25 U	130 U	250 U
1,2-Dibromoethane (EDB)	400 U	500 U	1,000 U	100 U	500 U	1,000 U
Chlorobenzene	100 U	130 U	250 U	25 U	130 U	250 U
Ethylbenzene	**840**	**1,200**	**660**	**230**	**540**	**1,200**
1,1,1,2-Tetrachloroethane	100 U	130 U	250 U	25 U	130 U	250 U
m,p-Xylenes	**870**	**1,700**	**1,500**	**190**	**1,200**	**3,100**
o-Xylene	**370**	**750**	**700**	**140**	**530**	**700**
Styrene	**390**	**590**	**240**	**31**	**130**	250 U
Bromoform	100 U	130 U	250 U	25 U	130 U	250 U
Isopropylbenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
1,1,2,2-Tetrachloroethane	100 U	130 U	250 U	25 U	130 U	250 U
Bromobenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
n-Propylbenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
1,2,3-Trichloropropane	100 U	130 U	250 U	25 U	130 U	250 U
2-Chlorotoluene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
1,3,5-Trimethylbenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
4-Chlorotoulene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
tert-Butylbenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
1,2,4-Trimethylbenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
sec-Butylbenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
4-Isopropyltoluene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
1,3-Dichlorobenzene	100 U	130 U	250 U	25 U	130 U	250 U
1,4-Dichlorobenzene	100 U	130 U	250 U	25 U	130 U	250 U
n-Butylbenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
1,2-Dichlorobenzene	100 U	130 U	250 U	25 U	130 U	250 U
1,2-Dibromo-3-chloropropane (DBCP)	400 U	500 U	1,000 U	100 U	500 U	1,000 U
1,2,4-Trichlorobenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
Hexachlorobutadiene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
Naphthalene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
1,2,3-Trichlorobenzene	400 U	500 U	1,000 U	100 U	500 U	1,000 U
TOTAL VOCs	**120,000**	**280,000**	**570,000**	**50,000**	**580,000**	**850,000**

NOTES:

1. The data in this table from 2009 and 2010 was previously included in quarterly progress reports. Data from May 2011 will be included in the pending progress report for the second quarter of 2011 reporting period.
2. VOCs = volatile organic compounds.
3. Analyzed using EPA Method 8260.
4. Results reported in μg/L.
5. Detected results highlighted in bold.
6. U = the compound was not detected at or above the concentration shown.
7. Sample was collected after purging 250 gallons of water during well development.
8. Sample was collected from purge water drum containing 130 gallons of water collected during well development.
9. Total VOC concentrations include the sum of detected VOCs, and the sum is rounded to the nearest significant digit that is consistent with the laboratory report.

ILLUSTRATIONS

ILLUSTRATIONS



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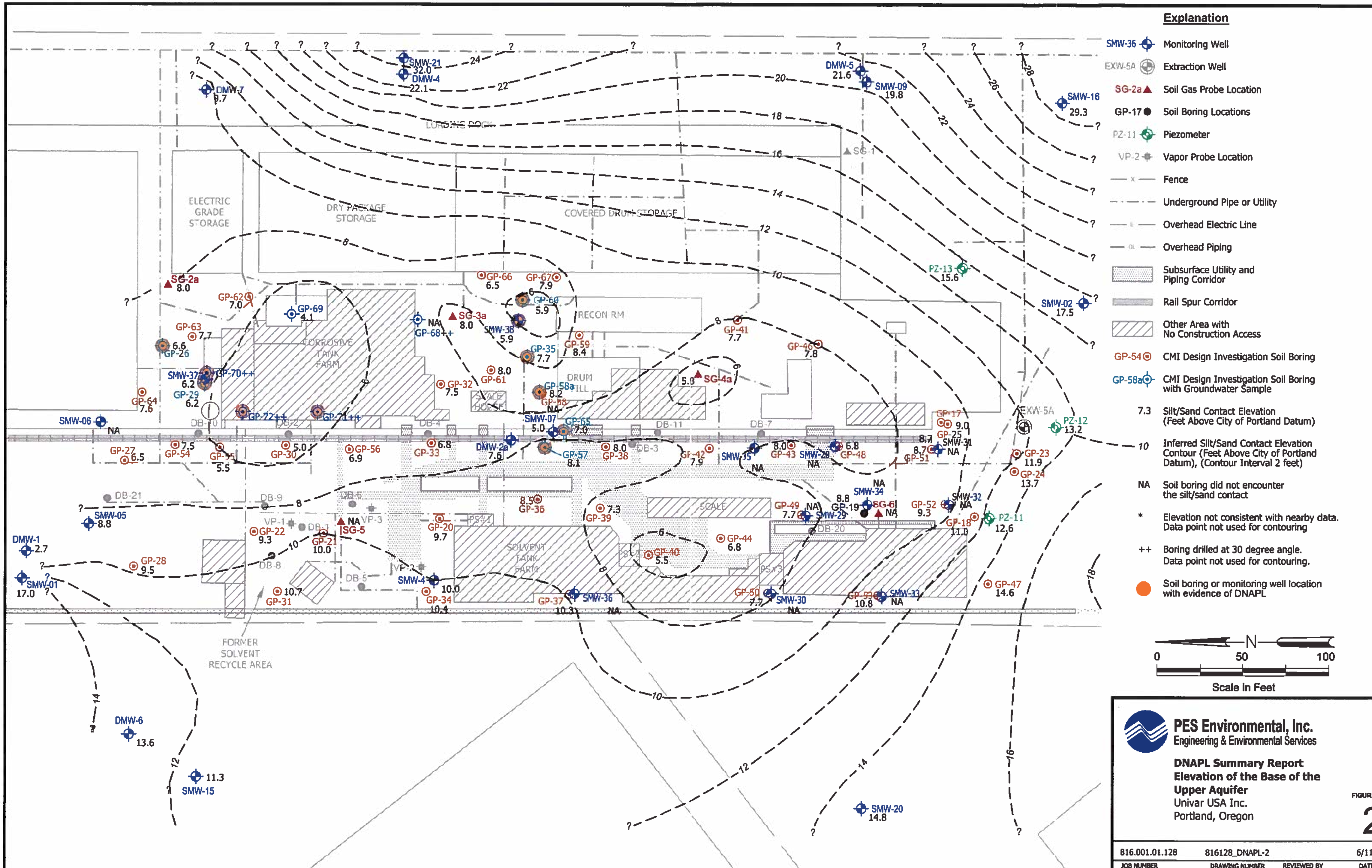
DNAPL Summary Report
Site Map
Univar USA Inc.
Portland, Oregon

FIGURE
1

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
816.001.01.128	816128_DNAPL-1		6/11



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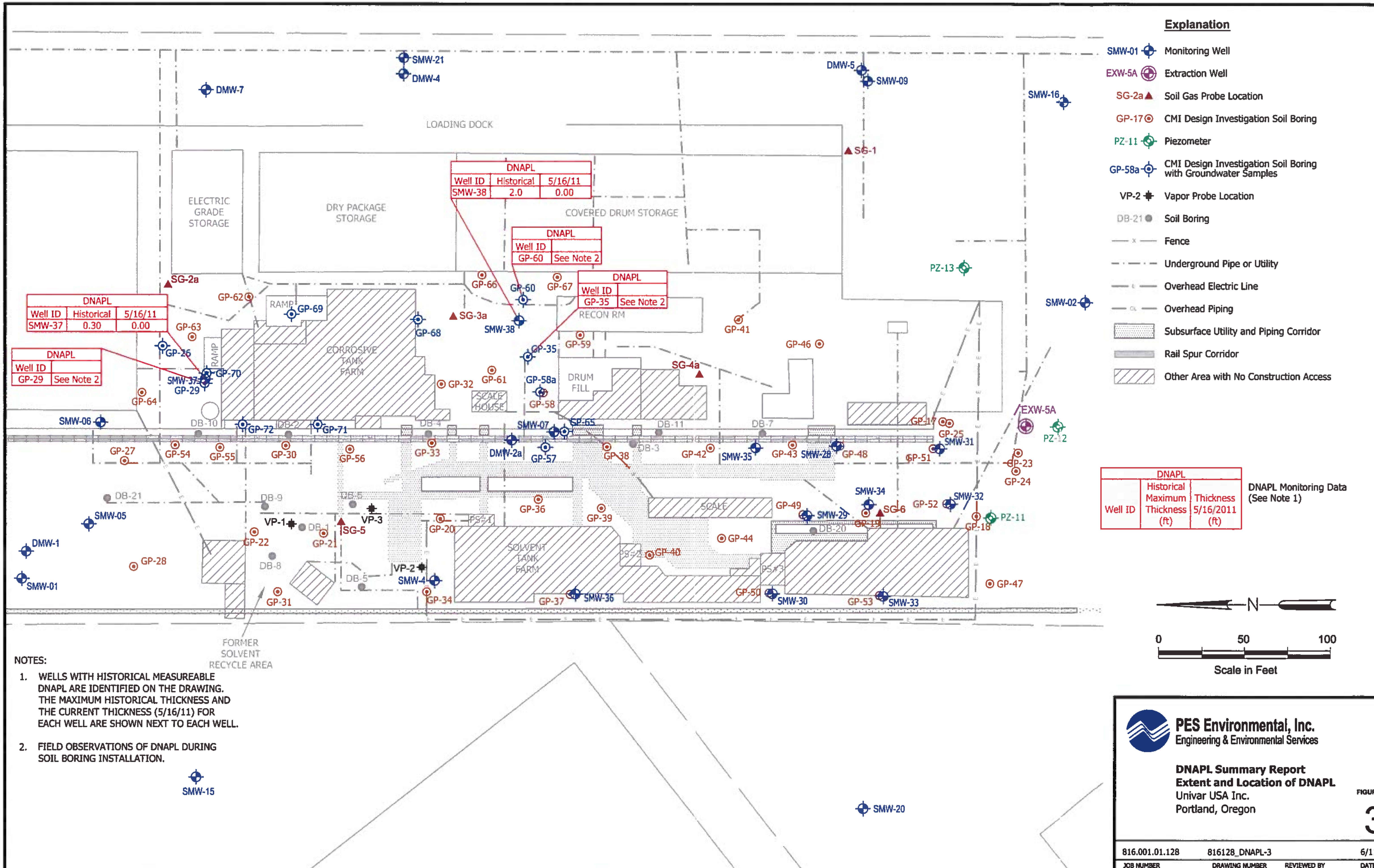
DNAPL Summary Report
Elevation of the Base of the Upper Aquifer
Univar USA Inc.
Portland, Oregon

FIGURE 2

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
816.001.01.128	816128_DNAPL-2		6/11



NOTES:

1. WELLS WITH HISTORICAL MEASUREABLE DNAPL ARE IDENTIFIED ON THE DRAWING. THE MAXIMUM HISTORICAL THICKNESS AND THE CURRENT THICKNESS (5/16/11) FOR EACH WELL ARE SHOWN NEXT TO EACH WELL.
2. FIELD OBSERVATIONS OF DNAPL DURING SOIL BORING INSTALLATION.

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DNAPL Summary Report
Extent and Location of DNAPL
Univar USA Inc.
Portland, Oregon

FIGURE 3

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
816.001.01.128	816128_DNAPL-3		6/11

ATTACHMENTS

SOIL BORING LOGS AND WELL CONSTRUCTION DIAGRAMS

- GP-26
- GP-29
- GP-30
- GP-35
- GP-57
- GP-58A
- GP-60
- GP-65
- GP-70
- GP-72
- SMW-37
- SMW-38

Note: These boring and well construction diagrams logs are included for reference only, and have been excerpted from Appendix B of the Draft Engineering Design Report (PES, 2009b).

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LOG OF BORING GP-26

DEPTH (FT)	PID (ppm)	SAMPLE INTERVAL (feet)	MATERIALS DESCRIPTION
0			**CONCRETE**
1		1-5	**BROWN SILT (ML)**, moist, firm, few fine sand, few fine gravel.
1.5	0.5		
2.5	1.2		@ 2.5 feet: becomes gray.
3.5	0.6		@ 3.5 feet: becomes brown, soft, trace fine sand.
5		5-10	
6	0.1		
7	0.3		
8	0.5		@ 8.0 feet: becomes gray.
8.5	0.6		**ORANGISH BROWN SAND (SP)**, moist, fine to medium, trace fines.
10		10-15	
10.5	4.2		
11.5	3.9		
12.5	7.5		@ 12.5 feet: becomes gray.
15		15-20	@ 15.0 feet: wet, becomes black.
15.5	6.6		
16.5	49.2		
17.5	35.6		
18.5	29.7		
20			

Bentonite chips

(Continued)

(Continued)

PROJECT	Univar USA	DIAMETER OF HOLE	2 inches
LOCATION	Portland, Oregon	TOTAL DEPTH OF HOLE	35 feet
JOB NUMBER	816.001.01.040		
GEOLOGIST/ENGINEER	Erin Shaver	DATE STARTED	4/7/08
DRILL RIG	Direct Push	DATE COMPLETED	4/7/08

PLATE

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LOG OF BORING GP-26

Depth (ft)	PID (ppm)	Sample Interval (feet)	Materials Description
20.0		20-25	@ 20.0 to 25.0 feet: noticeable chemical odor.
	50.3		
	78.1		
	96.2		
	140		
24.0			@ 24.0 feet: fines increase to few.
25		25-30	
	90.1		
	60.3		
27.0			@ 27.0 feet: fines increase to few.
	118		
	227		
30		30-35	
	48.7		
	72.6		
	63.7		**GREENISH GRAY CLAY (CL)**, soft, medium to high plasticity.
	40.4		
			BROWN SILT (ML), firm, low to medium plasticity, scattered organic material.
35			Bottom of boring at 35.0 feet.

Bentonite chips

Abandon soil boring and drill an additional boring located approximately 1.0 foot away for water sample. Push stainless steel groundwater screen with locking tip and screen from 31.0 to 32.0 feet. Collect groundwater sample GP-26-040708 @ 0940. Both borings abandoned with bentonite chips and concrete surface seal.

PROJECT	Univar USA	DIAMETER OF HOLE	2 inches
LOCATION	Portland, Oregon	TOTAL DEPTH OF HOLE	35 feet
JOB NUMBER	816.001.01.040		
GEOLOGIST/ENGINEER	Erin Shaver	DATE STARTED	4/7/08
DRILL RIG	Direct Push	DATE COMPLETED	4/7/08

PLATE

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LOG OF BORING GP-29

DEPTH (FT)	PID (ppm)	SAMPLE INTERVAL (feet)	MATERIALS DESCRIPTION
			CONCRETE
			BROKEN ROCK AND PEA GRAVEL (FILL)
		1-5	**GRAY SILTY SAND (SM)**, moist, fine, some fines.
	0.8		
			GRAY SILT (ML), moist, trace fine sand, low plasticity.
	1.1		
			BROWN SILTY SAND (SM), moist, fine, little fines.
	1.2		
5		5-10	
	1.1		
	1.4		@ 6.5 to 6.8 feet: wet.
	1.2		**GRAY SILT (ML)**, soft, medium plasticity.
			ORANGISH BROWN SAND (SP), moist, fine to medium, trace fines.
	1.1		
10	1.2	10-15	
	1.4		
	1.8		
15	1.4	15-20	@ 15.0 feet: becomes brown.
	1.3		
	1.1		
	1.1		
20			

Bentonite chips

(Continued)

(Continued)

PROJECT	Univar USA	DIAMETER OF HOLE	2 inches
LOCATION	Portland, Oregon	TOTAL DEPTH OF HOLE	35 feet
JOB NUMBER	816.001.01.040		
GEOLOGIST/ENGINEER	Erin Shaver	DATE STARTED	4/4/08
DRILL RIG	Direct Push	DATE COMPLETED	4/4/08

PLATE

UNIVARP-4-2 UNIVARP-4.GPJ 5/6/08

Depth	PID (ppm)	SAMPLE INTERVAL (feet)	SAMPLE RECOVERED	DEPTH (FT)	SYMBOLS	MATERIALS DESCRIPTION
	58.2	20-25				@ 20.0 feet: becomes black, sheen on water.
	66.7					
	70.1					
25	278	25-30		25		@ 25.0 feet: heavier sheen.
	404					
	376					
30		30-35		30		
	1321					
	1755					@ 32.0 feet: heavy sheen, visible product droplets.
	1888					**DARK GRAY SILT (ML)**, medium plasticity.
	603					@ 33.5 feet: becomes firm.
	219					
35				35		Bottom of boring at 35.0 feet.
40				40		

Bentonite chips

Abandon soil boring and drilled an additional boring located approximately 1 foot from original. Push stainless steel groundwater screen with locking tip and expose screen from 32.0 to 33.0 feet. Collect groundwater sample: GP-29-040408 @ 1530. Boring abandoned with bentonite chips and concrete surface seal.

PROJECT	Univar USA	DIAMETER OF HOLE	2 inches
LOCATION	Portland, Oregon	TOTAL DEPTH OF HOLE	35 feet
JOB NUMBER	816.001.01.040		
GEOLOGIST/ENGINEER	Erin Shaver	DATE STARTED	4/4/08
DRILL RIG	Direct Push	DATE COMPLETED	4/4/08

PLATE

PES Environmental, Inc.
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LOG OF BORING GP-35

Bentonite chips

DEPTH (FT)	PID (ppm)	SAMPLE INTERVAL (feet)	MATERIALS DESCRIPTION
0			**CONCRETE**
			BROWN SAND (SP), moist, fine, trace fines, trace coarse gravel.
1	0.1	0-5	
2	0.1		
3	0.1		
5		5-10	
6	0.4		
7	0.9		
8	1.1		
9	1.2		
10		10-15	
11	36.2		
12	68.6		**GRAY SILT (ML)**, wet, soft, medium plasticity.
13	4086		**BLACK SAND (SP)**, wet, fine to medium, trace to few fines, noticeable chemical odor. (Spotty sheen on water.)
14	3794		
15	1700	15-20	
16	850		
17	489		
18	372		
20			

(Continued)

(Continued)

PROJECT	Univar USA	DIAMETER OF HOLE	2 inches
LOCATION	Portland, Oregon	TOTAL DEPTH OF HOLE	35 feet
JOB NUMBER	816.001.01.040		
GEOLOGIST/ENGINEER	Erin Shaver	DATE STARTED	4/4/08
DRILL RIG	Direct Push	DATE COMPLETED	4/4/08

PLATE

PID (ppm)	SAMPLE INTERVAL (feet)	DEPTH (FT)	MATERIALS DESCRIPTION
218	20-25		
357			
182			
1700			
1672	25-30	25	
1827			@ 27.0 to 28.0 feet: brown product droplets (scattered), strong chemical odor, heavy sheen.
3083			
3211			
1282	30-35	30	
			GREENISH GRAY CLAY (CL), soft, medium to high plasticity.
606			**BLACK SILT WITH ABUNDANT ORGANIC MATTER**
342			**BROWN SILT WITH SAND (ML)**, moist, firm, few fine sand, scattered organic fragments.
288			
172			
		35	Bottom of boring at 30.0 feet.
			Abandoned boring and drilled an additional boring located approximately 1 foot from original. Push stainless steel groundwater screen with locking tip and expose screen from 30.5 to 31.5 feet. Collect groundwater sample: GP-35-040708 @ 1100.
			Boring abandoned with bentonite chips and concrete surface seal.
		40	

Bentonite chips

PROJECT	Univar USA	DIAMETER OF HOLE	2 inches
LOCATION	Portland, Oregon	TOTAL DEPTH OF HOLE	35 feet
JOB NUMBER	816.001.01.040		
GEOLOGIST/ENGINEER	Erin Shaver	DATE STARTED	4/4/08
DRILL RIG	Direct Push	DATE COMPLETED	4/4/08

PLATE

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LOG OF SOIL BORING: GP-57

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery	Depth (Feet)	Lithologic Description
Bentonite Chips (0–30 ft)		34.2		0	**ASPHALT**
		1,527			**BROKEN ROCK AND GRAVEL (FILL)**
	GP-57-4 (1515)	289	52		**GRAY SILTY SAND (SM),** wet, fine, some fines, chemical odor
		3,906			**GRAY SILT (ML),** moist, firm, few fine sand, low plasticity
					ORANGE BROWN SAND (SP), moist, fine to medium, trace fines, strong chemical odor
		3,501		5	
		1,720			**GRAY SILTY SAND (SM),** moist, fine
		247	54		**GRAY SILT WITH SAND (ML),** moist, soft, little fine sand @ 7.5 feet: sand decreases to trace
		4,702			**ORANGE BROWN SAND (SP),** moist, fine to medium, trace fines
		5,733			@ 8 feet: dark gray, wet
		7,922		10	
		4,937			
	GP-57-10 (1525)	1,407	55		
		1,521			
				15	
		1,502			
		572			
		431	55		
		282			
		1200		20	
		328			
		404			
		56.3	58		**GRAY SILTY SAND (SM),** moist, some fine
		28.1			
		497		25	
		3,821			**ORANGE BROWN SAND (SP),** moist, fine to medium, trace fines
		1,586			
	GP-57-27 (1540)	108.3	59		**BROWNISH GRAY SILT (ML),** moist, soft, few fine sand, low plasticity **GREENISH GRAY CLAY (CL),** soft, medium to high plasticity
		61.2			**BROWN SILT WITH SAND (ML),** firm, few fine sand, some organic material, low plasticity
				30	Bottom of Borehole at 30 feet bgs.
					Groundwater sample [GP-57-(25-27) (1000)] collected from temporary stainless steel screen from 25 - 27 feet. Groundwater purged for approximately 5 minutes, poor recharge, moderate to high turbidity.
				35	
				40	

Site Location: Portland, Oregon
Project: Univar - Portland (Supplemental Design Investigation)
Project No: 816.001.01.128
Logged By: Erin Shaver
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 30 feet
Drill Date: 9/8/08
Drilled By: Cascade Drilling
Drill Method: Direct Push

LOG OF SOIL BORING: GP-58A

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery	Depth (Feet)	Lithologic Description
Bentonite Chips					**ASPHALT**
					BROKEN ROCK AND GRAVEL (FILL)
		0.4			**ORANGE BROWN SAND (SP),** moist, fine, trace fines
		1.0	32		
		1.5			
				5	
		33.7			**BROWNISH GRAY SILTY SAND (SM),** moist, fine, some fines
		2,282			
	GP-58-7 (0920)	3,891	55		**GRAY SILT (ML),** moist, soft, trace organic material, medium plasticity @ 7.5 - 7.7 feet: wet
		1,428			
		437			**ORANGE BROWN SAND (SP),** moist, fine to medium, trace fines
				10	
		492			**GRAY SILT (ML),** moist, soft, medium plasticity
	GP-58-13 (0930)	2,378	47		**GRAY SILTY SAND (SM),** wet, fine, little fines
		9,873			
		8,342			**BLACK SAND (SP),** wet, fine to medium, trace fines, visible scattered product droplets, strong chemical odor
				15	
		7,987			
		8,216	40		
		4,737			
				20	
		>9,999			
		>9,999			
		8,527	60		
		9,314			
				25	
		7,132			
		8,912			
			60		
		5,321			
		6,172			
				30	
					DARK GRAY SILT (ML), moist, soft to firm, medium plasticity @ 32 - 33 feet: black, abundant organic material @ 33 feet: brownish gray, firm, trace fine sand
		123			
	GP-58A-30 (1520)	60.7	48		
		21.7			
		40.3			Bottom of borehole at 35 feet bgs.
				35	
				40	

Collected groundwater sample [GP-58A-(29-30) (1535)] from temporary stainless steel screen set at 29-30 feet below ground surface (bgs). Purged groundwater for approximately 5 minutes, turbidity low to moderate, water color slightly yellow, sheen, possibly effervescent.

Boring GP-58 logged for lithology to 20-feet bgs but abondoned due to poor sample quality. Secondary boring, GP-58A, drilled approximately 2 feet south of original location. Boring GP-58A logged for lithoigy from 20 to 35 ft bgs and groundwater sample collection.

Site Location: Portland, Oregon
Project: Univar - Portland (Supplemental Design Investigation)
Project No: 816.001.01.128
Logged By: Erin Shaver
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 35 feet
Drill Date: 9/10/08
Drilled By: Cascade Drilling
Drill Method: Direct Push

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LOG OF SOIL BORING: GP-60

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery	Depth (Feet)	Lithologic Description
Bentonite Chips		0.1			**CONCRETE**
		0.7			**BROWN SAND (SP),** moist, loose, fine to medium, trace fine gravel, trace fines
	GP-60-7 (0820)	1.5	41		
		0.8			**BROKEN CONCRETE AND GRAVEL (FILL)**
				5	**DARK GRAY SILT (ML),** moist, firm, some scattered organic fragments, trace fine sand, low plasticity
		8.7			
		25.2			
		33.6	52		
		20.7			**GRAY SAND (SP),** moist, fine to medium, trace fines
				10	**DARK GRAY SILT (ML),** moist, firm, some scattered organic fragments, trace fine sand, low plasticity
		74.6			
		108			@ 12 feet: wet
	GP-60-12 (0830)	132	48		
		38.7			**DARK GRAY / BLACK SAND (SP),** wet, fine to medium, trace fines
				15	
		40.0			
		91.6			
		38.7	50		
		40.3			
		23.6			
				20	
		40.2			
		27.3			
		21.4	47		
		50.7			
				25	
		63.8			
		70.7			
		23.5	39		
		4,327			
				30	
		2,888			@ 30 feet: visible yellowish product, strong chemical odor
		1,502			
	GP-60-31.5 (0930)	1,271	56		**DARK GRAY SILT (ML),** moist, soft, abundant black organic material, medium plasticity @ 34 feet: dark brownish gray, firm, low plasticity
		427			
				35	Bottom of borehole at 35 feet bgs. Collected groundwater sample [GP-60-(31.5-32.5) (0930)] from temporary stainless steel screen set at 31.5 - 32.5 feet below ground surface (bgs).
				40	

Site Location: Portland, Oregon
Project: Univar - Portland (Supplemental Design Investigation)
Project No: 816.001.01.128
Logged By: Erin Shaver
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 35 feet
Drill Date: 9/12/08
Drilled By: Cascade Drilling
Drill Method: Direct Push

LOG OF SOIL BORING: GP-65

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery	Sample Interval	Depth (Feet)	Symbol
Bentonite Chips		12.6				
		78.1				
	GP-65-4 (1345)	2,482	49			
		3,327				
					5	
		4,865				
		4,706				
	GP-65-8.5 (1355)	1,473	48			
		9,980				
					10	
		4,870				
		4,302				
		2,971	45			
					15	
		2,172				
		1,903				
		878	46			
		82.1				
		91.3				
					20	
		106				
		40.2				
			48			
		1,475				
		1,568				
					25	
		117				
	GP-65-28 (1405)	89.2	57			
					30	
					35	
					40	

Lithologic Description

ASPHALT

BROKEN ROCK

BROWN SILTY SAND (SM), wet, soft, some fine sand, low plasticity

GRAY SILT (ML), moist, soft, few fine sand, medium plasticity

TAN SAND (SP), moist, fine, trace fines

BROWN SILTY SAND (SM), moist, fine, some fines

GRAY SILT (ML), moist, soft, medium plasticity

ORANGE TAN SAND (SP), moist, fine to medium, trace fines

@ 10 feet: black

@ 12 feet: noticeable sheen on water surface and acetate liner

BROWN SILTY SAND (SM), wet, fine, some fines

BROWN SANDY SILT (ML), wet, soft, little sand

GREENISH GRAY SILTY CLAY (CL), firm, trace fines, trace fine sand

DARK BROWN SILT WITH SAND (ML), moist, firm, few fine sand, some black organic material

Bottom of borehole 30 feet bgs.

Collected groundwater sample [GP-65-(26-28) (1435)] from temporary stainless steel screen set at 26-28 feet below ground surface (bgs). Groundwater purged for approximately 5 minutes, turbidity decreased, water color yellowish.

Site Location: Portland, Oregon
Project: Univar - Portland (Supplemental Design Investigation)
Project No: 816.001.01.128
Logged By: Erin Shaver
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 30 feet
Drill Date: 9/8/08
Drilled By: Cascade Drilling
Drill Method: Direct Push

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LOG OF SOIL BORING: GP-70

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery (Inches)	Depth (Feet)	Lithologic Description
Bentonite Grout		0.2			CONCRETE
					BROWN SAND AND GRAVEL (SP/GP), moist
			60		GRAY SANDY SILT (ML), wet
		4.0			@ 4 feet: clayey gray silt, very dense
		2.0		5	
		2.5			@ 5 feet: brown with laminations
		1.5			
		1.7	60		
		2.0			
		0.5		10	
					BROWN SAND (SP), fine to medium, trace fines
		3.5			
			60		
		0.6			
				15	
		3.7			
		0.2			@ 17 feet: wet
			60		
		0.4			@ 18 feet: gray
				20	
		1.8			
		1.4	60		
		1.9		25	
		1.7			
		3.3			
		1.1	60		
		0.4			
		0.2		30	
		0.7			
			60		
		13.7		35	
		2.5			
	GP-70 @1716		60		
	GP-70-39-39.5 @1640	26.8			Groundwater sample (GP-70 @1716) collected from temporary stainless steel screen from 38-40 feet. Soil sample (GP-70-39-39.5) collected from 39-39.5 feet for laboratory analysis
				40	

Site Location: Portland, Oregon
Project: Univar - Portland (DNAPL Investigation)
Project No: 816.001.01.040
Logged By: Jerry Harris
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 45 feet
Drill Date: 6/25/09
Drilled By: Cascade Drilling
Drill Method: Direct Push

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LOG OF SOIL BORING: GP-70

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery (Inches)	Sample Interval	Depth (Feet)	Symbol	Lithologic Description
		28.5 14.5	60		45		GRAY TO BLUE GRAY SILT (ML)
					50 55 60 65 70 75 80		Bottom of borehole at 45 feet bgs Note: Boring drilled at 30-degree angle toward the south.

Site Location: Portland, Oregon
Project: Univar - Portland (DNAPL Investigation)
Project No: 816.001.01.040
Logged By: Jerry Harris
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 45 feet
Drill Date: 6/25/09
Drilled By: Cascade Drilling
Drill Method: Direct Push

PES Environmental, Inc.
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LOG OF SOIL BORING: GP-71

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery (Inches)	Sample Interval	Depth (Feet)	Symbol	Lithologic Description
Bentonite Chips							**CONCRETE**
		0.1					**TAN SAND (SP)**, dry
		0.0	60				
		14.9					
					5		**GRAY CLAYEY SILTY SAND (SM)**, dry
							TAN SAND (SP), moist, fine to medium, trace fines, trace silt laminations, trace wood debris
		22.0					
		1.2	60				
		1.8					
		0.4					
					10		
		18					
		12					
		15	60				@ 12 feet: large cobble
		>10,000					@ 14.5 feet: gray
					15		
		>10,000					@ 16 feet: grayish black
		154	60				
		1461					
					20		
		2080					
		108	60				
		53					
		49					
					25		
		109					
		139	60				@ 28 feet: wet
		114					
		91					
					30		
		109					
		113	60				
		140					
		886					
					35		

Site Location: Portland, Oregon
Project: Univar - Portland (DNAPL Investigation)
Project No: 816.001.01.040
Logged By: Jerry Harris
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 40 feet
Drill Date: 6/25/09
Drilled By: Cascade Drilling
Drill Method: Direct Push

LOG OF SOIL BORING: GP-71

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery (Inches)	Sample Interval	Depth (Feet)	Symbol	Lithologic Description
	GP-71 @1530 GP-71-37-37.5 @1500	584 64	60		40		GRAY GREEN CLAYEY SILT (ML),
					45		End of Borehole at 40 feet bgs Groundwater sample (GP-71@1530) collected from temporary stainless steel screen from 38-40 feet. Soil sample (GP-71-37-37.5) collected from 37-37.5 feet for laboratory analysis. Note: Boring drilled at 30-degree angle toward the north.
					50		
					55		
					60		
					65		
					70		

Site Location: Portland, Oregon
Project: Univar - Portland (DNAPL Investigation)
Project No: 816.001.01.040
Logged By: Jerry Harris
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 40 feet
Drill Date: 6/25/09
Drilled By: Cascade Drilling
Drill Method: Direct Push

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LOG OF SOIL BORING: GP-72

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery (Inches)	Sample Interval	Depth (Feet)	Symbol	Lithologic Description
Bentonite Grout							CONCRETE
							TAN SILT WITH GRAVEL (ML)
		0.0					
			60				
							BROWN SAND (SP), moist, medium
		0.0					
					5		
							@ 8 feet: trace silt laminations
		0.0	60				
		0.0					
					10		
		0.0					
		0.0					
		0.5	60				
							@ 13 feet: very damp
		0.7					
		24.3					
					15		
							@ 16 feet: wet, sheen
		324					
		5.8	60				
							@ 18 feet: gray, fine to medium
		1.7					
					20		
							@ 23 feet: gray to black, fine
		1.1	60				
		1.7					
		1.7					
					25		
		1.4					
			60				
		1.8					
		42.4					
					30		
		30.5					
		2.1	60				
		1.8					
					35		
							Groundwater sample (GP-72 @1230) collected from temporary stainless steel screen from 38-40 feet.
	GP-72 @1230		60				
	GP-72-38-39 @1145	44.3					Soil sample (GP-72-38-39) collected from 38-39 feet for laboratory analysis
							DARK GRAY SILT WITH CLAY (ML), moist, dense
					40		

Site Location: Portland, Oregon
Project: Univar - Portland (DNAPL Investigation)
Project No: 816.001.01.040
Logged By: Jerry Harris
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 45 feet
Drill Date: 6/26/09
Drilled By: Cascade Drilling
Drill Method: Direct Push

Borehole Completion	Soil Sample ID and Time	PID (PPM)	Sample Recovery (Inches)	Sample Interval	Depth (Feet)	Symbol	Lithologic Description
		119					
		5.0					
		6.5	60				
		6.0					
		15			45		
							End of borehole at 45 feet bgs
							Note: Boring drilled at a 30-degree angle toward the east.
					50		
					55		
					60		
					65		
					70		
					75		
					80		

Site Location: Portland, Oregon
Project: Univar - Portland (DNAPL Investigation)
Project No: 816.001.01.040
Logged By: Jerry Harris
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 2 inches
Total Depth: 45 feet
Drill Date: 6/26/09
Drilled By: Cascade Drilling
Drill Method: Direct Push

PES Environmental, Inc.
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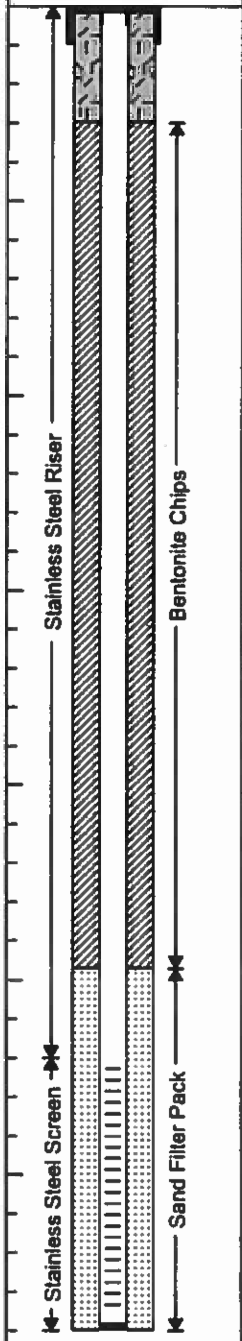
LOG OF MONITORING WELL: SMW-37



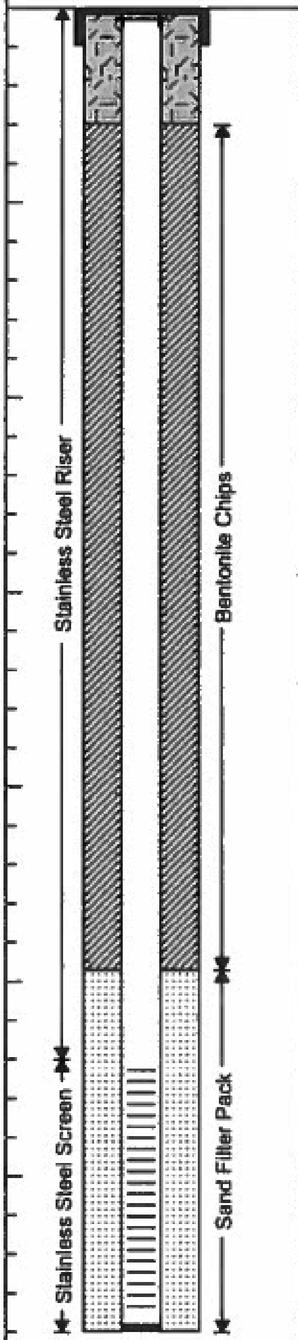
Soil Sample ID and Time	PID (PPM)	Depth (Feet)	Lithologic Description
			CONCRETE
			BROWN ROCK AND PEA GRAVEL (FILL)
			GRAY SILTY SAND (SM), moist, fine, some fines
			GRAY SILT (ML), moist, trace fine sand, low plasticity
	0.0		**BROWN SILTY SAND (SM),** moist, fine, little fines
	0.0		
		5	
			@ 6.5 to 6.8 feet: wet
	0.0		
			GRAY SILT (ML), soft, medium plasticity
			ORANGISH BROWN SAND (SP), moist, fine to medium, trace fines
		10	
	0.0		
		15	@ 15 feet: brown
	0.0		
		20	@ 20 feet: black, sheen on water
	0.0		
		25	@ 25 feet: heavier sheen
	0.0		
		30	
			@ 32 feet: heavy sheen, visible product droplets
			DARK GRAY SILT (ML), medium plasticity
			@ 33 feet: becomes firm
		35	**Note: Boring not logged, lithology and product observations from GP-29.**
		40	

Well Completion Details:
Total depth: 34.5 feet below ground surface (bgs)
4" 0.030 inch slotted stainless steel screen from 27 - 34 feet bgs
4" stainless steel blank casing from 0 - 27 feet bgs
2 x 12 sand pack from 24.7 - 34 feet bgs
Bentonite Chips from 3 - 24.7 feet bgs

Project: Univar - Portland (DNAPL Investigation)
Site Location: Portland, Oregon
Project No: 816.001.01.040
Logged By: Jerry Harris
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 13 inches
Total Depth: 34.5 feet
Drill Date: 6/24/09
Drilled By: Cascade Drilling
Drill Method: Hollow Stem Auger

LOG OF MONITORING WELL: SMW-38

Well Completion	PID (PPM)	Depth (Feet)	Symbol	Lithologic Description
				

PID (PPM)	Depth (Feet)
41	
	5
52	
	10
48	
	15
50	
	20
47	
	25
39	
	30
56	
	35
	40

CONCRETE

BROWN SAND (SP), moist, loose, fine to medium, trace fine gravel, trace fines

BROKEN CONCRETE AND GRAVEL (FILL)

DARK GRAY SILT (ML), moist, firm, some scattered organic fragments, trace fine sand, low plasticity

GRAY SAND (SP), moist, fine to medium, trace fines

DARK GRAY SILT (ML), moist, firm, some scattered organic fragments, trace fine sand, low plasticity

@ 12 feet: wet

DARK GRAY / BLACK SAND (SP), wet, fine to medium, trace fines

@ 30 feet: visible yellowish product, strong chemical odor

DARK GRAY SILT (ML), moist, soft, abundant black organic material, medium plasticity
@ 34 feet: dark brownish gray, firm, low plasticity

Boring not sampled; lithology and product observations from GP-60.

Well Completion Details:

Total depth: 34.5 feet below ground surface (bgs)
4 Inch 0.030 inch slotted stainless steel screen from 27 - 34 feet bgs
4 Inch stainless steel blank casing from 0 - 27 feet bgs
2 x 12 sand pack from 24.7 - 34 feet bgs
Bentonite Chips from 3 - 24.7 feet bgs
Concrete Surface Seal with flush with grade monument from 0 - 3 feet bgs

Project: Univar - Portland (DNAPL Investigation)
Site Location: Portland, Oregon
Project No: 816.001.01.040
Logged By: Jerry Harris
Notes: PID measured in parts per million (ppm)

Diameter of Borehole: 13 Inches
Total Depth: 34.5 Feet
Drill Date: 6/24/09
Drilled By: Cascade Drilling
Drill Method: Hollow Stem Auger